

# Examples of Offshore Renewable Energy



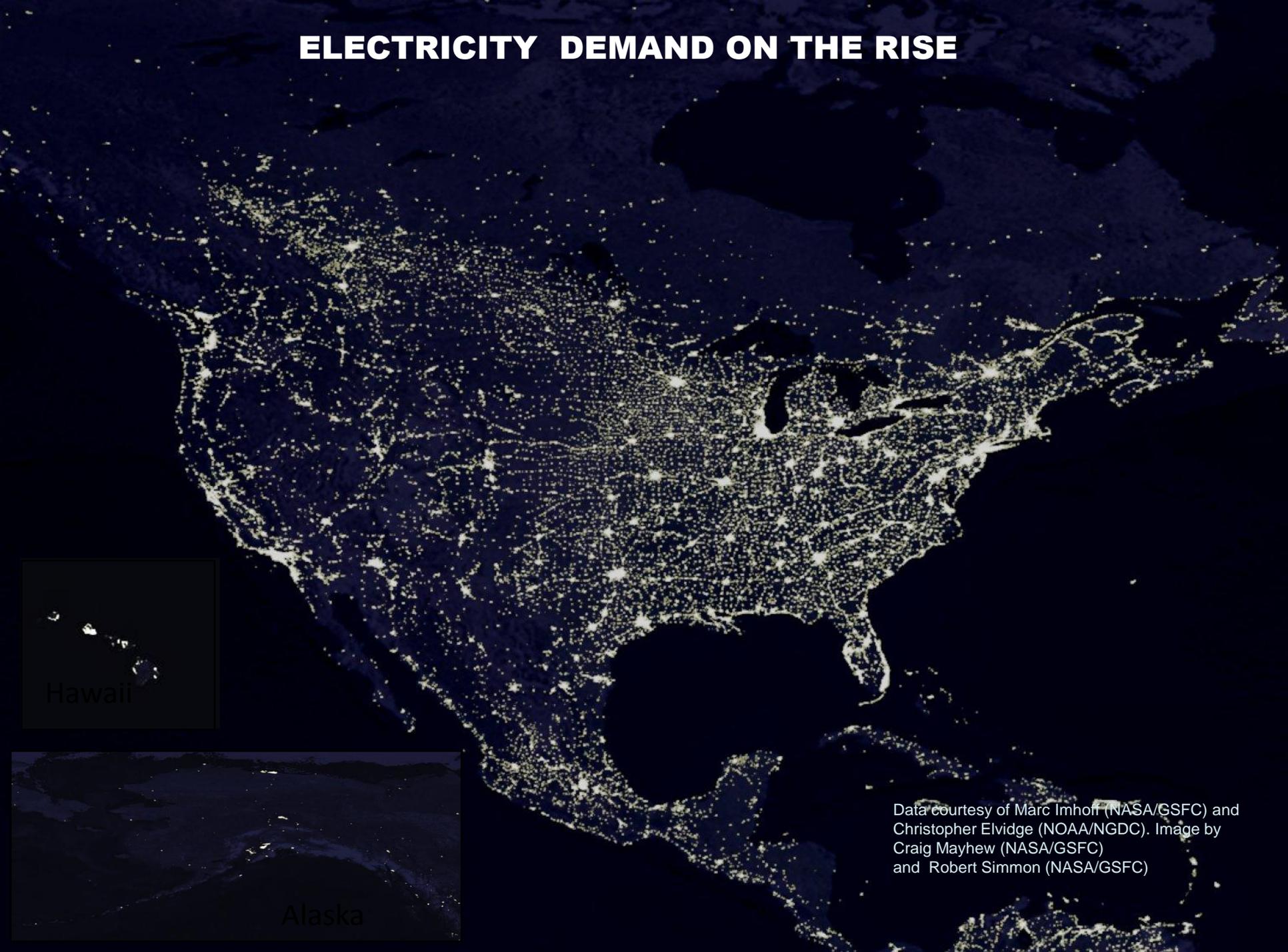
Wind Energy

Wave Energy

Ocean Current  
Energy



# ELECTRICITY DEMAND ON THE RISE



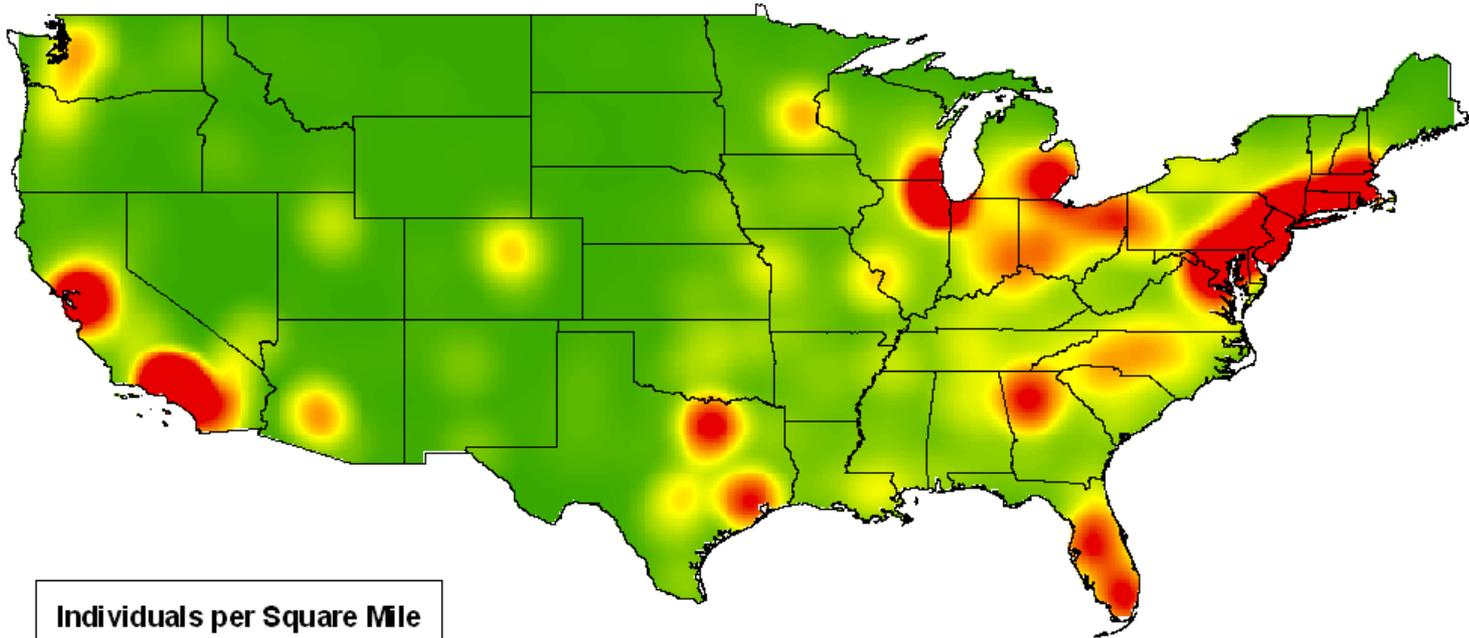
Hawaii



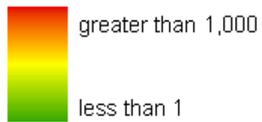
Alaska

Data courtesy of Marc Imhoff (NASA/GSFC) and Christopher Elvidge (NOAA/NGDC). Image by Craig Mayhew (NASA/GSFC) and Robert Simmon (NASA/GSFC)

## Population Density of the Contiguous United States



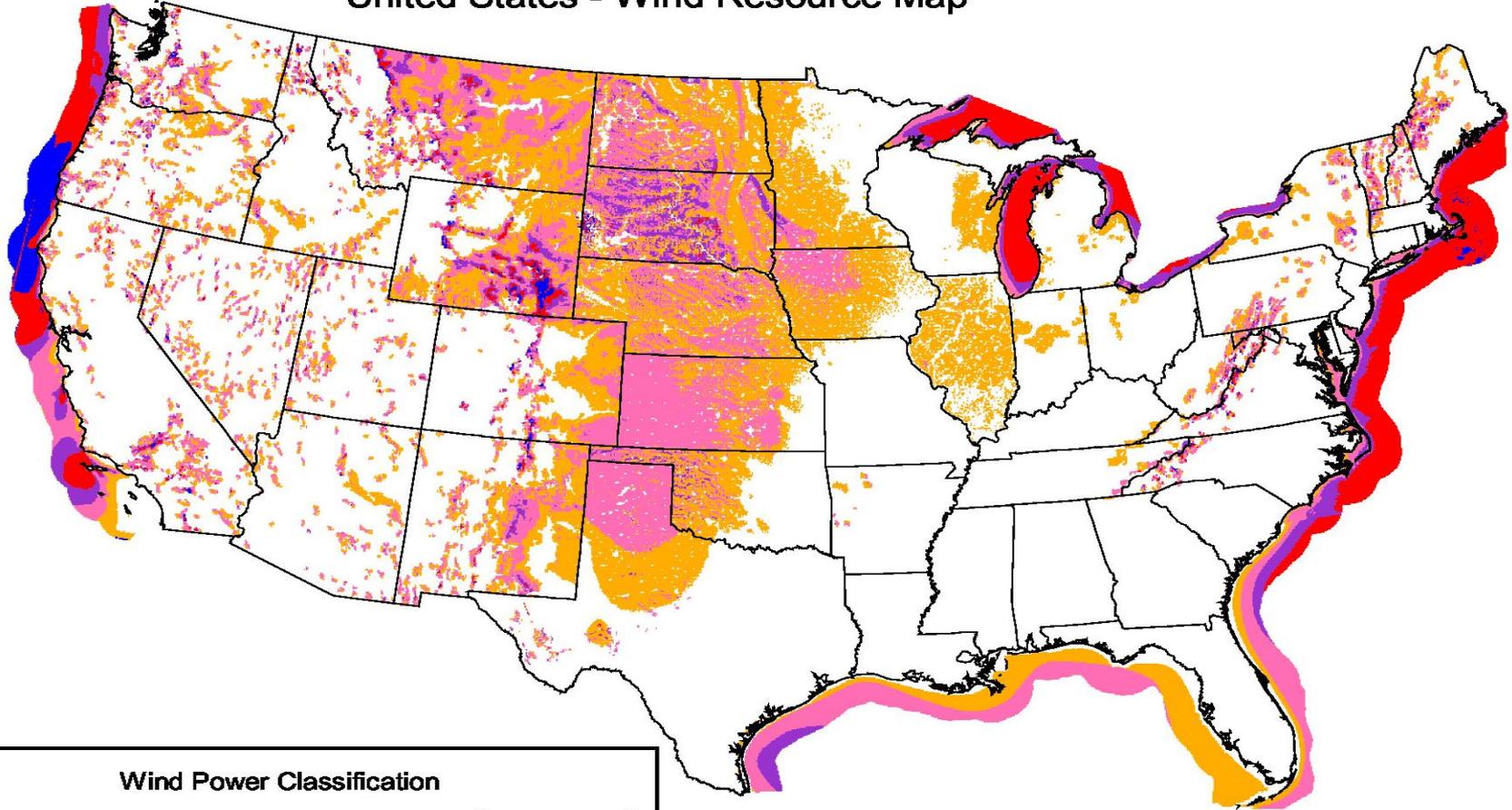
### Individuals per Square Mile



# U.S. Wind Speed Data

Substantial Offshore Resources Located Near Coastal Areas

United States - Wind Resource Map



## Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m $W/m^2$	Wind Speed <sup>a</sup> at 50 m m/s	Wind Speed <sup>a</sup> at 50 m mph
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

<sup>a</sup>Wind speeds are based on a Weibull k value of 2.0

# What About Watts?

- Household power is measured in KW (kilowatts)
- 1,000 KW = 1 MW (megawatt)
- 1,000 MW = 1 GW (gigawatt)
- A mid-size coal-fired electrical plant produces ~350 MW; so 1 GW = output from 3 typical coal plants

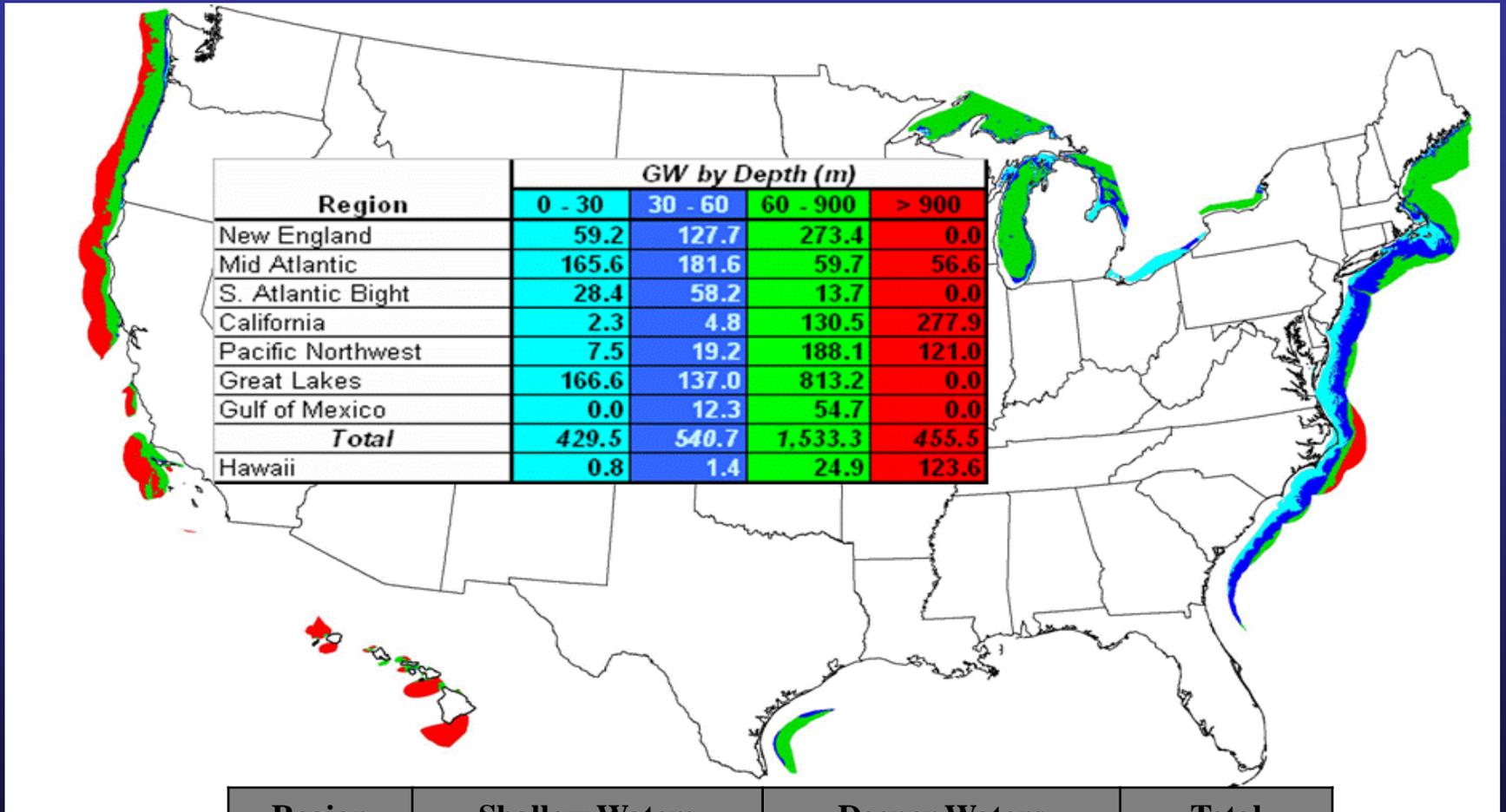


# Energy Consumption

- The average American household uses about 10,655 kilowatt-hours per year (kWh/y)
- 1 GW of wind power will supply between 225,000 to 300,000 average U.S. homes with power annually.



# Regional Offshore Wind Energy Potential Capacity

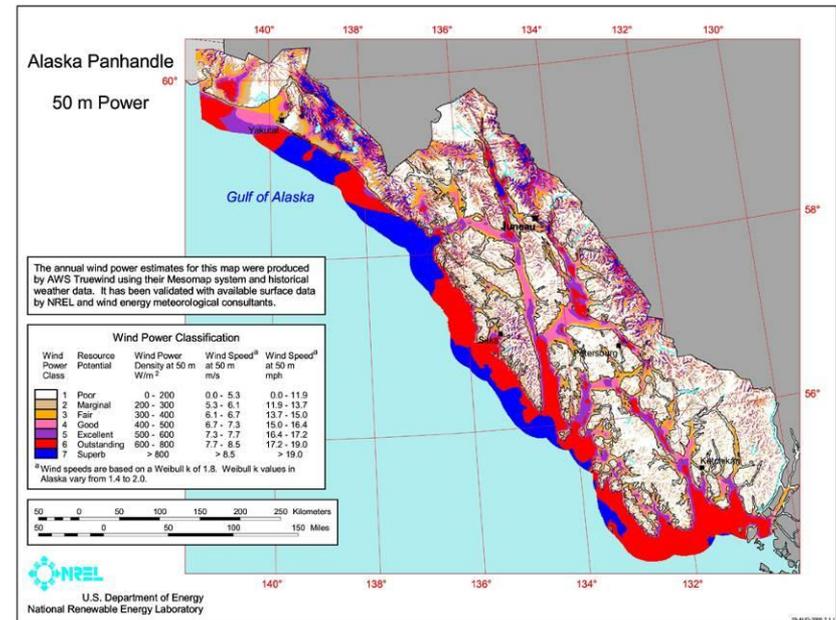
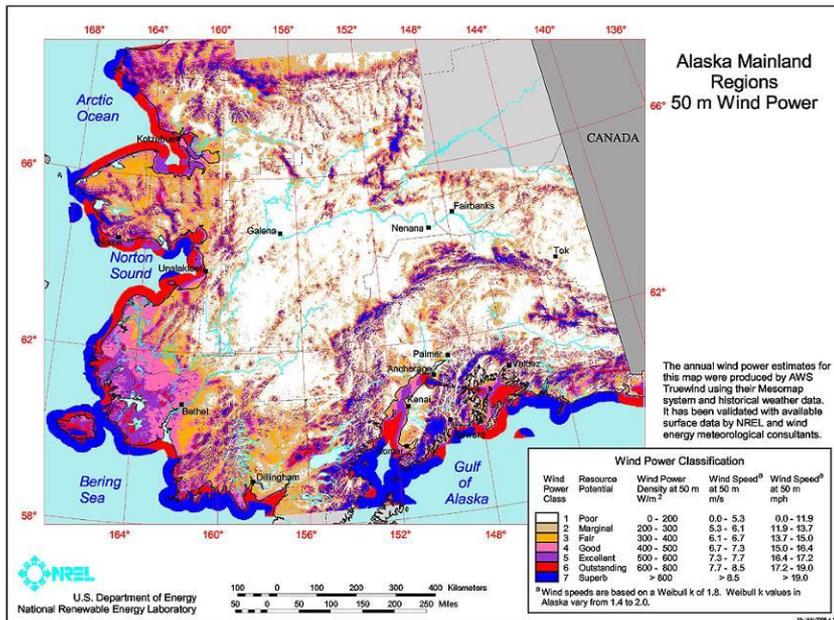


Region	Shallow Waters	Deeper Waters	Total
<b>Atlantic</b>	<b>253.2 GW</b>	<b>770.9 GW</b>	<b>1024 GW</b>
<b>Pacific</b>	<b>9.8 GW</b>	<b>741.5 GW</b>	<b>751 GW</b>
<b>Gulf</b>	<b>0 GW</b>	<b>67 GW</b>	<b>67 GW</b>

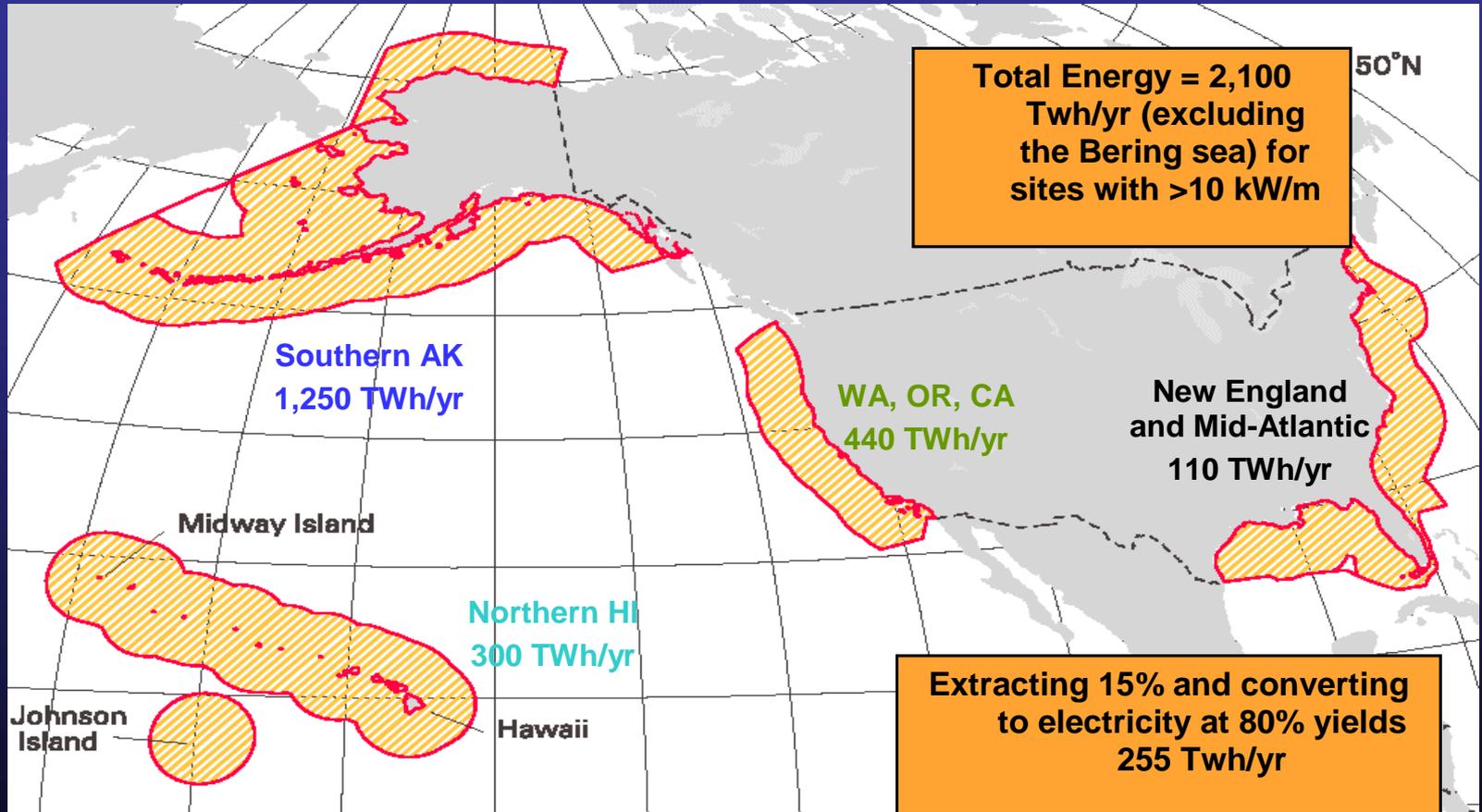
# Alaska Profile

- Outstanding wind, wave, and tidal resources
- Low population density/electricity demand
- Physical and environmental challenges to develop resources

# Alaskan Wind Resource: Excellent, but difficult to develop



# U.S. Offshore Wave Energy Resources



**Greatest resource potential occurs in the Pacific, especially Alaska**

# Potential Offshore Wave Energy

## *Alaska OCS*

- Alaska has the best wave resource in the entire U.S.
- EPRI estimates the wave resource to be 1,250 TWh/y. Assuming 15-percent of that would be developed results in a potential of **187 TWh/y or 59 GW**—enough to power about **17.5 million average U.S. homes.**
- Developers face challenges:
  - Harsh weather
  - Unproven technology
  - Remote location
  - Limited demand for energy



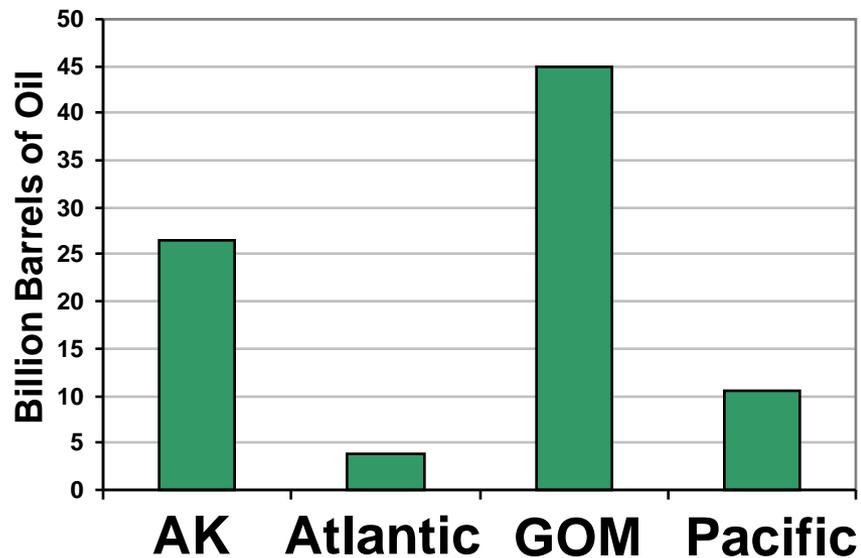
# Oil and Gas Resources

*After more than 50 years of exploration and development, 70% of total resources are yet to be discovered.*

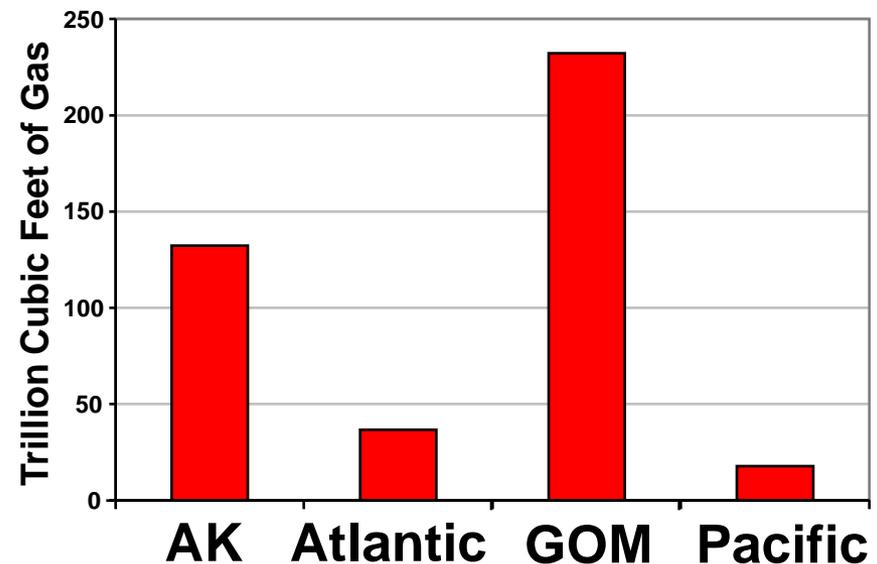


# Undiscovered Technically Recoverable Oil and Gas Resources 2006 National Assessment Results

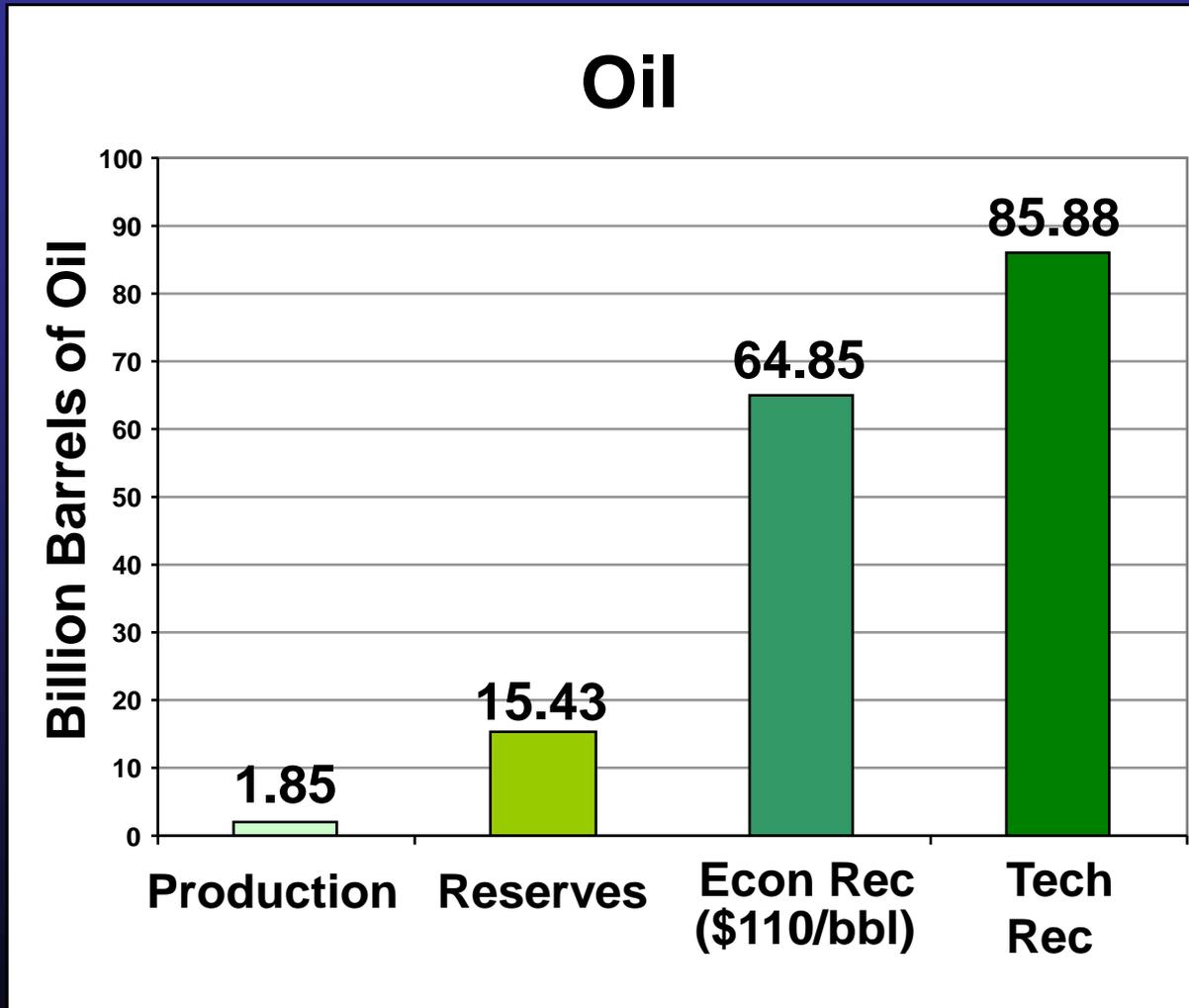
## OCS Oil



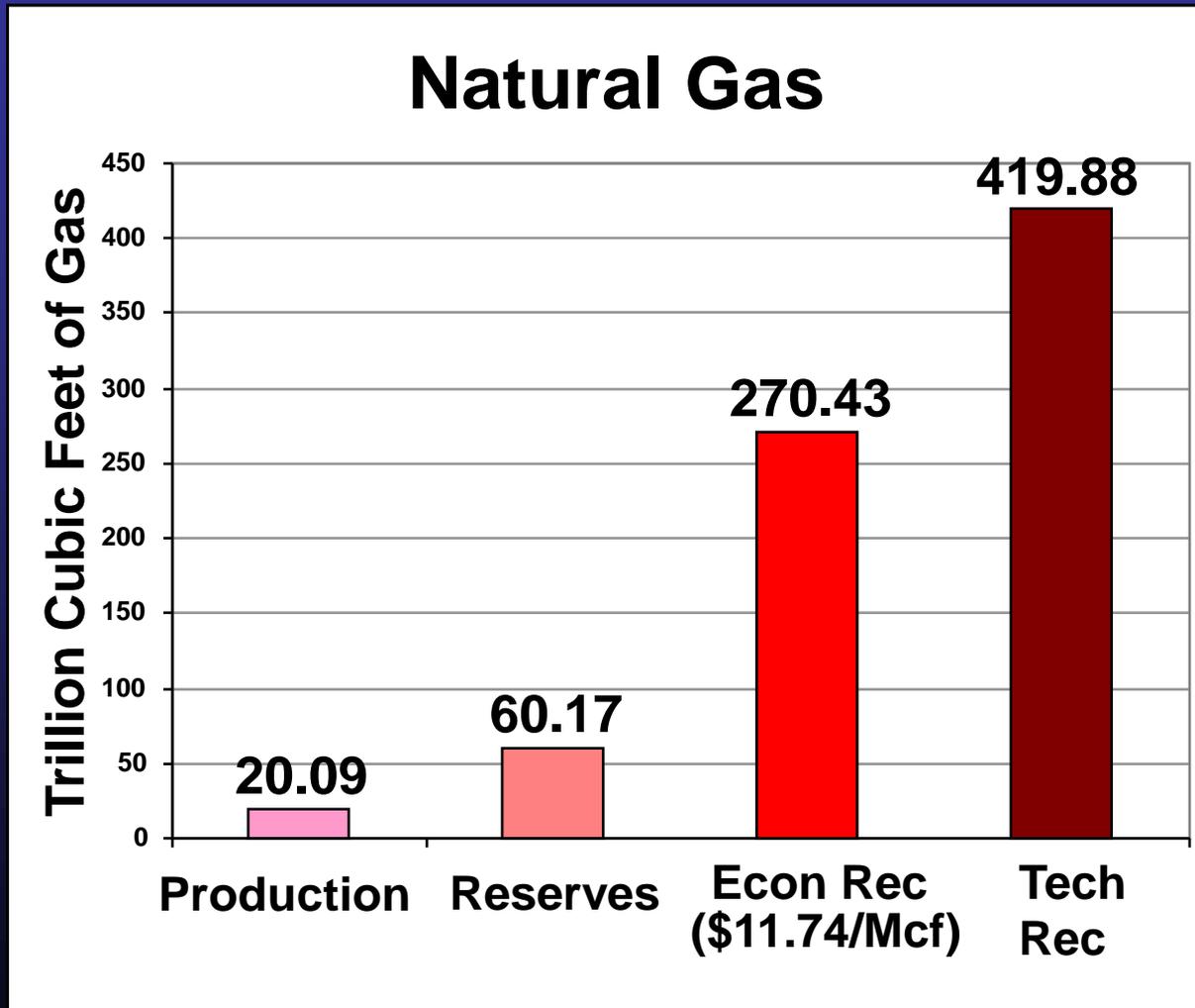
## OCS Gas



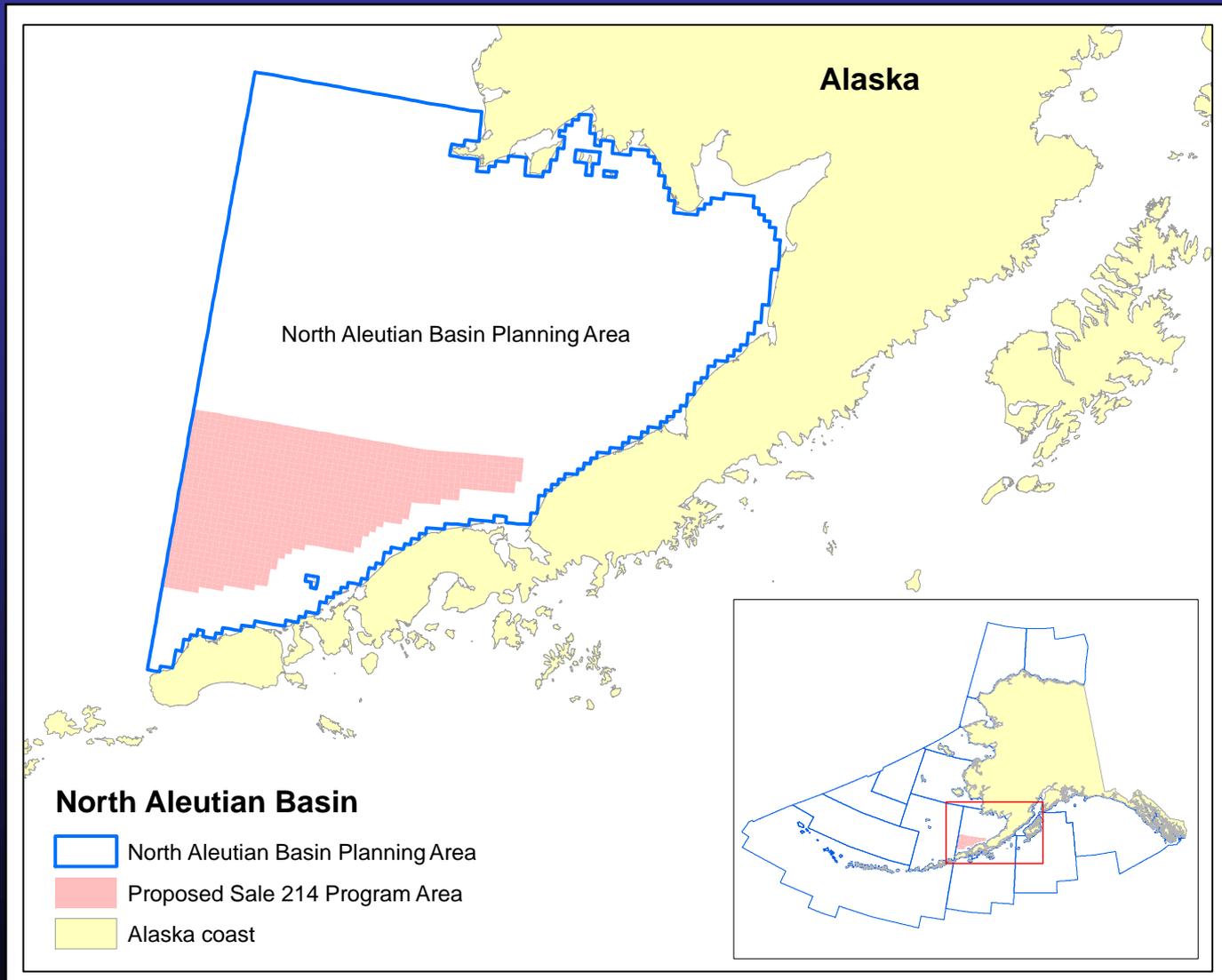
# U.S. Annual Oil Production, OCS Reserves, and Resources



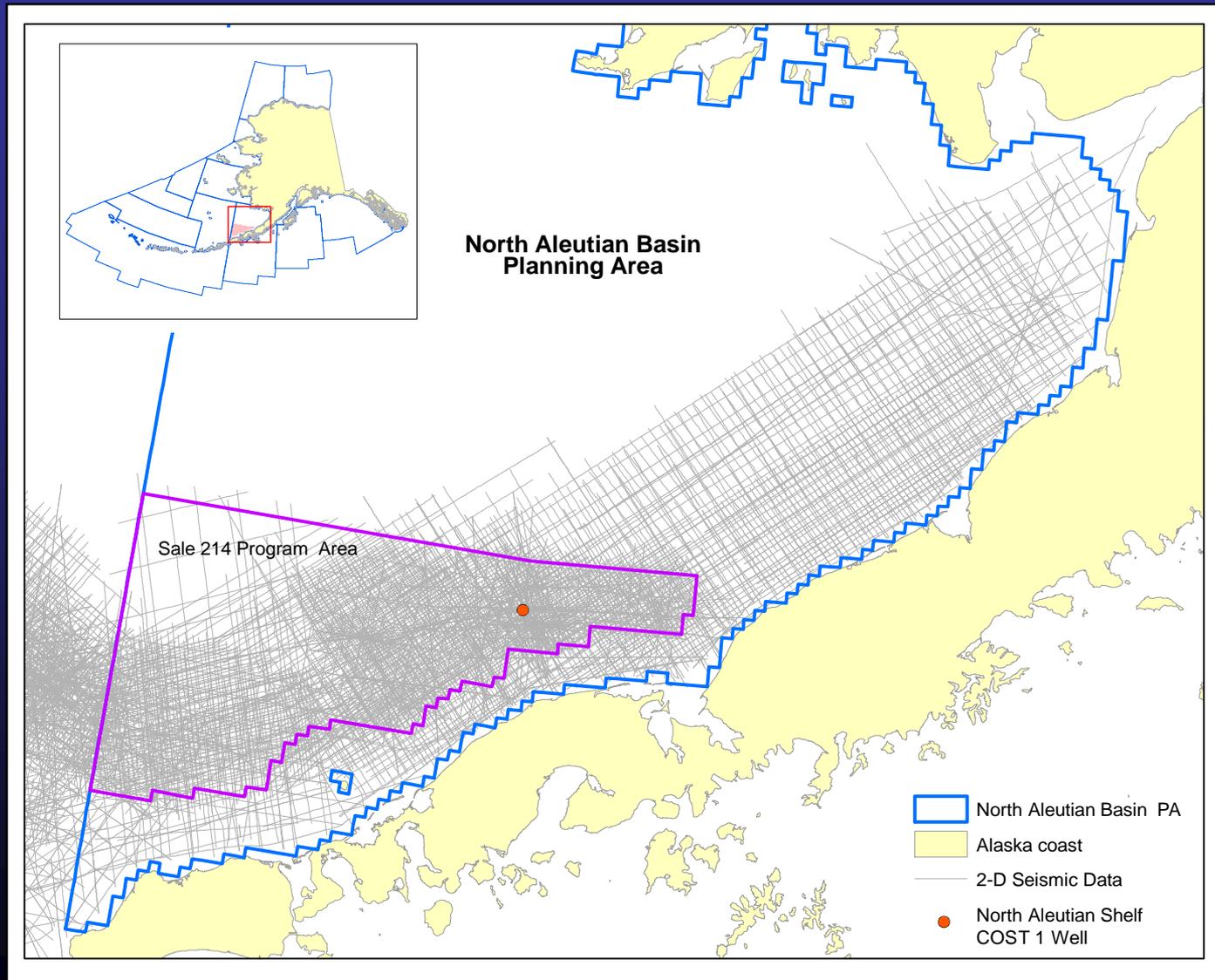
# U.S. Annual Gas Production, OCS Reserves, and Resources



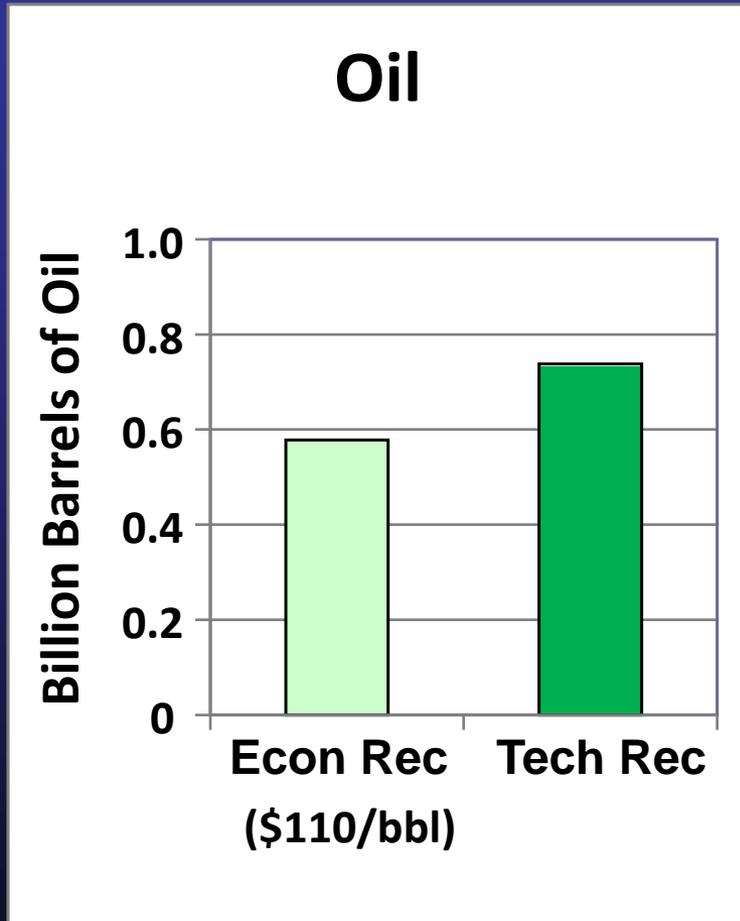
# North Aleutian Basin Planning Area



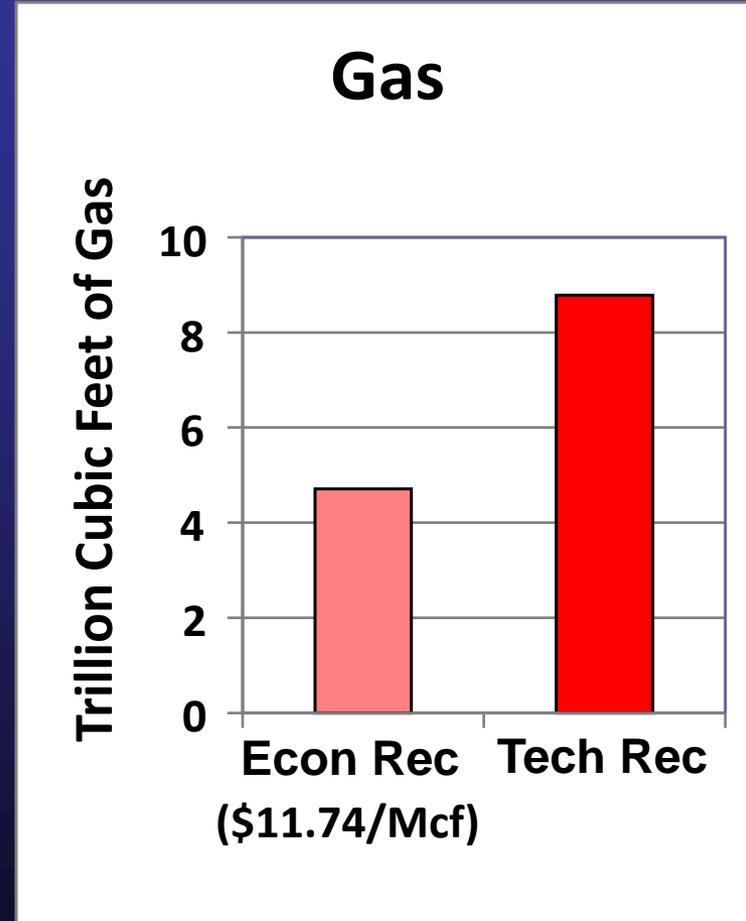
# North Aleutian Basin Exploratory Well and Seismic Data



# North Aleutian Basin Undiscovered Oil and Gas Resources



**Oil Resources:**  
**0.02 – 2.5 billion barrels**



**Gas Resources:**  
**0.4 – 23.3 Trillion Cubic Feet**

# North Aleutian Basin Oil and Gas Resource Data Gaps

- Seismic data were acquired between 1975 and 1988.
- New seismic and related data may be desired for some areas in the North Aleutian Basin Planning Area by the oil and gas industry as part of their pre-leasing evaluation.
- Prior to acquisition of seismic data, National Environmental Policy Act (NEPA) and other environmental analyses will be required.

# Key Environmental Issues

## Stewardship

### *Our Overriding Consideration*

#### ***BALANCING:***

- the Nation's energy needs
- Environmental sensitivity and marine productivity
- Multiple use of the sea and seabed

# The Challenge of Climate Change

## Forecasting, planning for and mitigating:

- **Long-term Ecosystem Changes**
  - (and effects on species and habitats)
- **Changes in Renewable Energy Resources**
  - e.g. Wind and Wave frequency, persistence, etc.
- **Changes in Environmental Conditions and Impacts to Energy Infrastructure**
  - (storms, sea level, wave heights, etc.)

# Alaska - North Aleutian Basin Key Environmental Challenges

- Fisheries - Multiple-use of sea and sea bed
- Cultural - Subsistence Fishing
- Risk of Oil Spills
- Noise in the Sea – potential effects on marine mammals and fish
- Lack of Existing Onshore Infrastructure

